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Pedestrian quality of service: Lessons from Maracanã Stadium

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Abstract

Based on an extensive literature review, this article identifies the attributes that define the pedestrians quality of service, and based on interviews conducted with spectators at the three matches of the FIFA Confederations Cup that were played in June 2013 at Maracanã stadium in Rio de Janeiro, characterizes and identifies the most important attributes associated with the choice of travel on foot. These results contribute to the understanding of pedestrian behaviour at major sporting events – with the World Cup 2014 and the Olympic Games 2016 already in mind. The attributes that best define the pedestrian quality of service are accessibility, comfort, reliability, convenience, security, safety and sociability. In the case of Maracanã, the aspects most emphasized by the respondents interviewed were related to accessibility: rapidity, proximity and ease. However, we found that the perceived walking times – for all of the interviewed people – were shorter than the actual trip times. The stadium's location and the characteristics of the social and built environments are conditions that favour travel on foot and perceived proximity. These factors can be enhanced by good transportation and urban planning policies. However, pedestrians that make trips longer than 30 minutes are attracted to the use of motorized modes, unless certain restrictions to these modes are present.

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1. Introduction

In the past two decades, research on pedestrian mobility has been increasing in the fields of transportation, urban planning and public health. A part of this research has focused on characteristics of urban environments that favour walking, and a growing number of studies have examined pedestrian levels of service, while less interest has been shown in the study of pedestrian quality of service, especially in the context of Latin American cities. Quality of service is defined as the result of the pedestrians' perception of walking conditions and it is formed by attributes associated with the trip. This perception depends on the personal and socioeconomic characteristics of the pedestrian and the trip's purpose.

The Rio de Janeiro Metropolitan Region (RJMR) has a population of more than 11 million inhabitants, who daily make 16 million motorized trips, of which over 90% are taken by private vehicle, taxi and bus. These vehicles compete for the scarce road space in congested conditions, aggravated by frequent traffic accidents. About 7 million non-motorized trips are taken daily, mainly on foot, representing 30.32% of total trips. This mode, due to its fragility and importance, deserves special attention to ensure the quality and safety of journeys (PDTU, 2011). Despite the relevance of walking in the RJMR, to the best of our knowledge there are no studies evaluating the quality of walking trips.

On the other hand, Rio de Janeiro has been gaining visibility for hosting major events and on these occasions transport policy aims to encourage sustainable mobility, but without the requirements and guidelines of international standards, as will be the case with the FIFA World Cup (FWC) and the Olympic Games, scheduled for 2014 and 2016, respectively. Maracanã stadium, located about 5 km west of the city's downtown district, has a fundamental role in both events, because besides hosting many soccer matches, including the World Cup final, it will also host the opening and the closing ceremonies of the Olympics. There are high expectations regarding the legacies derived from these events and the resulting improvements in public services, especially those associated with transport modes that are less aggressive to the environment, such as walking. The protests that occurred during the Confederations Cup in Brazil, originally triggered by the increase in bus fares, ratify and reinforce these expectations.

In this context, with the milestone of the FWC to be held in Brazil in 2014, the federal and local governments have been defining a series of action plans and making investments aimed at promoting the use of more sustainable modes of transport during the event. The Confederations Cup, held in June 2013, served as a pilot project to assess transport strategies. In the case of Maracanã stadium, the Rio de Janeiro municipal government applied a set of measures to promote public transport and discourage the use of private cars. Nevertheless, based on the 1,095 questionnaires applied in the present survey, in the three matches played in this stadium, 14.32% of the trips were made by car and 7.43% by taxi, while 7.52% of respondents travelled on foot, a percentage higher than the 2% estimated by the Municipal Transport Department.

In major sporting events, where large numbers of people travel simultaneously, meeting transport demands is of critical importance for the success of the event and to mitigate the urban and mobility impacts (Pinto *et al.*, 2012). Mass transit systems are best suited to meet these demands and transport policies should be aimed at promoting these modalities. Still, other modes are also used and walking trips are an option if the destination is within a reasonable distance and the urban conditions are suitable. Moreover, all spectators of these events have to walk to access and exit the premises. In spite of this, there has been little investigation into this mode in the case of major sporting events.

This study aims to contribute to the knowledge in this area, highlighting the importance of walking in the context of major sporting events and the perception of pedestrians regarding the quality of service. With an exploratory approach, surveys with the fans who attended the matches played in Maracanã Stadium were conducted. The results allow characterizing the trips and identifying the attributes of such trips considered in modal choice in this specific context, taking into account those attributes identified in the literature review.

2. Pedestrians Quality of Service

In transportation, quality of service (QS) can be defined as a traveller-based perception of how well a service or facility is operating (FDOT, 2009). It is formed by attributes associated to the trip and therefore it provides

aggregated information about the qualitative aspects directly perceived by users, which often correspond to the reasons for choosing a transport mode (Cardoso, 2012). According to Ewing and Handy (2009), the perceptions are responsible for mediating the relationship between the physical characteristics of the environment and the behaviour of pedestrians.

Since they belong to the context of perceptions, attributes have a subjective and intangible nature, which makes their definition more difficult. According to Serrano (2003), perception is how the external stimuli are selected, organized and interpreted by each individual. In transport practice, these stimuli can be considered as the set of variables which represent each attribute of the QS. The variables are tangible elements that directly or indirectly affect the quality of the walking environment through the perception and sensations experienced by each user (Ewing & Handy, 2009).

Overall, in the studies on the quality of the walking environment, objective and direct measures focusing on variables have been prioritized to the detriment of subjective measures, such as the attributes. The walkability study tools that have been developed in recent decades to assess the quality and availability of infrastructure for pedestrians are numerous (Guo & Loo, 2013). These measurements are intended to examine the technical quality of the road infrastructure, making sure it is in accordance with established standards.

Regarding the technical quality of the walking environment, another aspect that stands out is the relationship between urban structure and patterns of walking trips. Since the 1990s, approaches such as New Urbanism, Smart Growth and Transit Oriented Development have emerged as more sustainable alternatives of urban development that suggest high-density, mixed land use, well-connected street networks and public transit. According to different researchers, this urban model favours walking trips and decreases dependence on cars (Larranaga, 2012). From these assumptions, many indexes of walkability have been created with the purpose of measuring, through the characteristics of the built environment, the capability of the place to encourage walking as an effective transportation mode.

Another popular method for assessing the quality of the walking environment is the level of service (Fruin, 1971). This concept is often confused with the quality of service, despite having different aspects. According to the Highway Capacity Manual (TRB, 2010), level of service is a quantitative indicator determined from a set of technical measures used to measure various aspects of the operation, so unlike QS, this method does not consider user perceptions. The goal of level of service is to measure the performance and the relations between the supply of infrastructure and the demand of the pedestrian flow (FDOT, 2009).

In this sense, although the characteristics of the built environment and road infrastructure influence the attributes and the quality perceived by pedestrians, to assess these dimensions is different from assessing the quality related to perceptions, such as sense of comfort, safety or convenience (Ewing & Handy, 2009). Pedestrian behaviour is better understood through careful analysis of perceptions than through objective characteristics of the built environment (Clifton *et al.*, 2007). Therefore, QS can be considered as a qualitative measure with idiosyncratic nature, because its evaluation depends on the personal and socioeconomic characteristics of pedestrians and the characteristics of the trip (Cardoso, 2012).

In the literature on transport quality of service, in general some attributes stand out for being considered more often. They are: accessibility, reliability, comfort, convenience, rapidity, safety and security (Cardoso, 2012). In the case of walking trips, sociability can be added to these attributes, which despite being little investigated, stands out in the studies concerned with walking as a recreational activity. Table 1 summarises the attributes which compose the quality of pedestrian service and the concepts and variables related to it.

According to the bibliographic review, it can be seen that the attributes vary according to the trip's purpose. In the case of walking trips, besides being a mode of transportation to reach destinations, walking is also a type of exercise and a recreational activity. When walking trips aim to fulfil this second purpose, attributes such as comfort, reliability, convenience and sociability tend to be more valued by pedestrians (Addy *et al.*, 2004). However, when the purpose of the trip is to reach a final destination within a preset time, attributes such as accessibility and speed tend to be more valued (Koh & Wong, 2013, McConville *et al.*, 2010, Middleton, 2009). Attributes related to safety and security are considered important for all the purposes of walking trips (Sanches & Ferreira, 2010, Hoehner *et al.*, 2005, Owen *et al.*, 2004).

Regarding walking trips with the purpose of accessing sporting events, the pedestrian quality of service has not been properly explored yet in order to identify the attributes that stand out in this context. A recent survey with

potential spectators of the matches of the World Cup 2014 in the city of Manaus highlighted that the choice of non-motorized modes in the context of major events is made mainly due to factors such as transport cost, unavailability of the automobile, city appreciation (aesthetic) and health (Malhado & Rothfuss, 2013).

Table 1. Attributes that define pedestrian quality of service

Attribute	Concept	Variables
Accessibility	The ease to access the activities or specific destinations through the transport system (Morris <i>et al.</i> , 1979).	Diversity and density of land use. Distance and proximity. Quantity, connectivity and continuity of paths. Presence of infrastructure for pedestrians.
Rapidity	Shorter trip time with the briefest delays in reaching a destination (Hoogendoorn & Bovy, 2004).	Absence/presence of obstacles. Continuity and connectivity of paths. Volume of pedestrians. Crossing time.
Comfort	Personal well-being or satisfaction of the pedestrian, provided by the interaction with the environment during a walk (NZTA, 2009).	Pavement and width of the sidewalk. Absence/presence of obstacles. Topography. Noise and pollution. Cleanliness. Landscaping. Weather conditions.
Convenience	Characteristics of the system that facilitate the movement of pedestrians according to their personal interests and in comparison with other transport modes (Carreno <i>et al.</i> , 2002).	Continuity of the route. Directness routes. Ease of crossing. Proximity.
Reliability	The ease for pedestrians to direct their movement and certainty of its achievement (Cardoso, 2012 and NZTA, 2009).	Information and signage for pedestrians. Legibility of paths.
Safety	Possibility of generating conflict between pedestrians and vehicles (NZTA, 2009)	Volume and speed of traffic. Safety of intersections. Separation between pedestrians and vehicles.
Security	Pedestrian sensation of vulnerability to the possibility of crimes (Austroads, 2012).	Night-time lighting and visibility. Antisocial behaviours. Policing. Movement of other pedestrians.
Sociability	Possibility of pedestrians to socially interact in the walking environment (NZTA, 2009).	Areas of social convenience. Festive atmosphere. Presence of other pedestrians.

Despite being associated with leisure, trips generated by major sporting events have rather unique characteristics, especially when they are world-scale events like the Confederations Cup. Aspects like ticket price, importance of the competition, socioeconomic profile of the spectators and the type of transport strategy developed by local authorities will directly influence the perception of the attributes of walking trips in major events. Therefore, this article aims to contribute in this sense.

3. Maracanã Stadium and its Zone of Influence

Maracanã stadium was built to host the 1950 FWC, and it on various occasions it held 180,000 fans. Sixty-three years later, with its most recent renovation for the 2014 FWC, its capacity has been modified to 76,000 seats (SMTR, 2013). Despite its significant reduction, to meet safety and comfort demands, the stadium still attracts a large number of trips, and the consequent impacts on traffic need to be properly planned and mitigated. Besides that, it is important to take advantage of these events to encourage the use of the most socially productive transport modes, to encourage the extension of such use to everyday commutes.

Maracanã stadium is relatively close to the city's downtown area (about 5 km) and it is served by the main transport systems available in Rio de Janeiro, such as the subway and suburban railway lines, which provide easy access to strategic areas of the city, like the South Zone with its famous Copacabana and Ipanema beaches. They also connect it to more peripheral regions, such as Baixada Fluminense and the West Zone. Surrounding the stadium, there are three subway stations and three commuter rail stations.

However, due to the short extension of the subway line (44 km) and the low capacity of the railroads – about 600 thousand passengers per day – besides the lack of integration, both modes do not satisfactorily meet the needs of the population and neither do they perform structuring and articulating functions, intrinsic to these modes. Instead, they are responsible for less than 8% of transit trips (PDTU, 2005), contrary to good international examples. Anyway,

several bus lines pass by Maracanã and are alternatives to reach other locations not served by railway and subway modes.

The stadium is located in the neighbourhood called Tijuca, which, along with two other communities, Vila Isabel and São Cristóvão, forms the stadium's area of influence and the macro-zone of Tijuca. Of the nine macro-zones that constitute the municipality of Rio de Janeiro, Tijuca is among the three with the highest incomes. Taking into account the total number of households with a nominal monthly per capita income five times higher than the minimum monthly wage, which is the highest level of income according to the Brazilian Institute of Geography and Statistics (BIGS, 2010), this area contributes nearly 15% of the city's population belonging to this income group. This indicates that the residents of at least 45 thousand households have financial conditions to participate in events with higher prices, such as the Confederations Cup (IPPRIO, 2013). Insofar as the modal choice is influenced by socioeconomic characteristics, the segments with the highest purchasing power tend to be more likely to use automobiles, as happens in the region neighbouring Maracanã stadium. On the other hand, this proximity can favour walking as an alternative, whenever there are attractive conditions for walking trips, complemented by measures to restrict access by car.

The mentioned area of influence, considering a radius of approximately 2.2 km, covers an area of about 15 km². The population of these three administrative regions is more than 455 thousand (BIGS, 2010), which equates to a density of about 300 inhabitants per hectare (ha). Several authors suggest that density influences the mobility and the mode of transportation used, tending to reduce the per capita use of automobiles as the density increases (Rodrigues *et al.*, 2014). According to the German Federal Environment Agency [FEA] (2012), for cities with a density below 20 inhabitants/ha, the use of automobile can be 4 to 12 times higher than those with densities of 150 to 300 inhabitants/ha, as happens in the macro-zone of Tijuca.

Besides the density, the area of influence of the Maracanã stadium also features mixed land use and a network of relatively connected paths, providing a built environment that is favourable to walking. However, it is still important that the infrastructure and services for pedestrians, not only in the immediate surroundings but in the whole area of influence, be appropriate to encourage the use of this mode.

4. Characterization of Pedestrians and their Trips

From an exploratory focus, two models of questionnaires were used with spectators during the three matches occurring at Maracanã. The first one, identified as “compact”, with a wider sample range, asked about user information – age, gender, residence – and the characteristics of the trip taken to reach the stadium – origin and mode. The second one, called “complementary”, had elicited same information as the compact questionnaire, but it included questions concerning the perception of trip quality and walking route to the stadium with the attributes of the walk having also been consulted. At a later time, the data were processed and validated, which resulted in a total of 1,095 validated compact questionnaires and 351 complementary ones. From the total sample, 7.52% of the participants had chosen walking trips, a number corresponding to 82 people who answered the compact questionnaire and 26 people answering the complementary one. The most relevant results are shown below.

4.1. Spatial distribution of trips

The origins of all walking trips were in the macro-zone of Tijuca, where Maracanã is. Due to restrictions to long distance walking trips (Scovino, 2008), this result corresponds to what we expected. Still, nearly 29% of trips originating within this macro-zone happened in motorized modes, mainly taxi and subway (Table 2). There are three subway stations in this sector, meaning that these people chose this mode to travel through only two stations. A little over 4% of the trips were taken by car, despite parking restrictions.

The results lead to some interesting interpretations. On the one hand, they indicate that the urban conditions of the macro-zone of Tijuca favour walking trips, as previously mentioned. On the other hand, despite the cost of taxi and parking difficulties, these travel modes persist. Almost 9% of the trips were taken by subway to travel a relatively short distance, probably due to the fact that free subway tickets were given to the spectators attending the event on that day.

Table 2. Modal choice of trips originating in Tijuca and all trips

Transportation Method	Originating in Tijuca (%)	All Origins (%)
Car	4.21	14.32
Taxi	10.53	7.43
Collective Transport of Private Use	0	10.73
Subway	8.42	45.17
Train	2.11	5.01
Bus	3.16	9.82
Walking	71.58	7.52
Total	100.00	100.00

4.2. Pedestrian profile

Of the total of people who walk to Maracanã, 85.18% live in the macro-zone of Tijuca, and considering that all walking trips are concentrated on this area, the origin of the trip is closely related to the traveller's place of residence. A total of 9% of the pedestrians live in other areas, mainly in the southeast of the country, and 6.17% in other areas of the RJMR. It is possible that some of these travellers choose walking trips because they are guests in the area because of performing some activity in the surrounding area previous to the match. However, this small proportion reveals that the macro-zone of Tijuca is not characterized as a hotel area, unlike the south and centre areas of the RJMR.

Generally speaking, the socioeconomic characteristics of the pedestrians are similar to those of the other spectators, with a heavier presence of young male individuals. Despite that, in relative terms pedestrians are older and women present are in a higher number. Of the pedestrians, 63.75% are aged from 18 to 40, while in the total sample this group represents 72.67%. Women were responsible for 28.32% of total trips and 35.80% of walking trips. The profile of pedestrians can be explained by the demographic composition of the macro-zone, which is characterized by having a large elderly population compared to other macro-zones of the RJMR.

4.3. Time behaviour of pedestrians

On Sundays, walking trips are more significant. On the first Sunday match, 8.93% of the total trips were walking trips and on the second Sunday match, the final match, 12.10%. On the Thursday match these trips were only 4.43%. These data seem to indicate that due to work and schedule limitations, some people preferred motorized transport on Thursday, whereas stricter parking restrictions on the final match day motivated the choice for walking.

By analysing the time of pedestrians' arrival at the stadium, it can be highlighted that most spectators arrive early for the match. Over 95% arrive 90 minutes beforehand. The strong concern with time of arrival is a typical characteristic of trips generated for major events, since in this context the possibility of delays caused by the large number of people coming to the same place is bigger (Robbins *et al.*, 2007). Problems such as traffic jams, changes in the traffic system, the high pedestrian flows and the lines at the entrance gates – caused both by the volume of spectators and security procedures – delays the entrance to the stadium. Besides that, in the case of the Confederations Cup, the occurrence of protests in the surrounding area of the stadium on match days increased the possibility of access problems even more, which might have influenced the time of arrival.

Considering the comments of focal groups made to the research team to questions about the perceived value of walking trips' attributes, the importance of arriving early is related to the possibility of ensuring easy access to the stadium and also to the desire of enjoying the festive environment generated in the area around the stadium on match days, specially the final one.

Although the behaviour of people arriving at the stadium is similar between those who chose walking trips and those who chose other modes, the times of arrival are scattered. This could be associated with the level of trust pedestrians have in relation to the time of walking trips, unlike other modes in which users are exposed to a greater

number of external elements that are out of their control (traffic jams, parking difficulties, public transport shortage, among others).

5. Characterization of Attributes and Quality of Walking Trips

5.1. Attributes of walking trips

The complementary questionnaire inquired about the reasons why people had chosen walking trips. Those reasons can be related to travel attributes (Cardoso, 2012). The reasons stated by the users are rapidity, proximity, convenience, avoidance of confusion, group fun and parking limitations. According to the results and taking into account that each individual interviewed could indicate more than one aspect, rapidity was the most valued attribute: 50% of the pedestrians mentioned it, followed by proximity (38.46%) and convenience (19.23%). The remaining aspects were indicated by less than 8% of the individuals.

The three most frequently mentioned attributes are related to the concept of accessibility, considered in the literature as one of the most relevant factors explaining modal choice. Accessibility has been defined in different ways and generally it is considered as a measurement that expresses the ease of moving between locations or also the ease of interaction between activities (Florez, 1998). In other words, it represents the level of convenience in reaching a destination by using a means of transportation (Morris *et al.*, 1979). When questioned, the respondents made reference to the ease of walking trips. Therefore, it can be interpreted that this aspect is an expression of the good accessibility conditions for pedestrians in this sector, as well as the suitable infrastructure for pedestrians around the stadium, among other aspects.

Regarding proximity, it represents the distance between the origin and the destination, being the distance an accessibility measure. This attribute, as indicated in Table 1, is related to mixed land use and to population density around Maracanã, so that a great number of people are at walking distance from the stadium. The connectivity of the road system in this sector also favours route choice.

Rapidity is the attribute to which most of the users refer and is another expression of the good accessibility conditions of the area, which is associated with the relation between time and distance in the walking journey. Travel time is related to distance, absence of obstacles, existence of direct paths and possibility of selecting shorter and less crowded routes. Nevertheless, the rapidity attribute has a comparative base with other available transport modes and, in the context of this analysis, it can be more closely compared with the use of automobiles.

Another important aspect to highlight is that parking difficulties are considered an important element in discouraging the use of automobiles. Around 82% of pedestrians who own a vehicle revealed that the option for walking was made due to difficulties in parking. Because 50% of the pedestrians interviewed have an automobile and that 31% made trips longer than 20 minutes and adding the fact that the perception of quality is inversely proportional to travel time (according to the results of the complementary questionnaire), it can be concluded that there is a group of individuals susceptible to changing from walking to motorized mode, mainly car and taxi. Moreover, at the Thursday match the proportion of walking trips decreased and the number of taxi trips originated in the macro-zone of Tijuca increased, indicating that private motorized modes are travelling options within this macro-zone.

A group of pedestrians justifies the option for walking trips in order to “avoid confusion”. This aspect is linked to the attributes of trust and security, meaning that these users consider that taking the trip by other transportation systems can be more complex and involve elements that are out of their control, such as waiting time, public transport availability and search for parking. Additionally, the legibility of the walking route and previous experience in taking such route favours this choice. Pedestrians also mentioned as a positive factor for walking the conditions of the social environment (group fun), which suggests that the company of friends encourages walking trips and, in the case of matches at Maracanã, it is also a relevant element.

5.2. Time of walking trips

In the complementary questionnaire, all individuals were consulted on the time spent on the way to Maracanã and the origin of the trip or the distance from their motorized transport disembarking location. Almost 77% of the people

indicated a time of up to 10 minutes. In the cases of pedestrians who spent longer times, approximately three-quarters of walking individuals indicated that the trip took between 11 and 30 minutes (Table 3).

Table 3. Time of walking trips according to main transport mode in %

Main Transportation Mode	Walking Trip Time (%)			
	< 5 min	5 - 10 min	>10 - 20 min	>20 - 30 min
Car	6.86	7.43	4.57	0.86
Taxi	2.57	1.71	1.71	0.29
Collective Transport of Private Use	0.00	1.71	0.86	0.00
High Capacity Transport	31.71	17.43	6.29	0.86
Bus	0.86	4.57	1.71	0.57
Walking	0.29	1.71	3.14	2.29
Total	42.29	34.56	18.28	4.87

People who made the complete journey walking have the most varied origins within the macro-zone of Tijuca, thus a single origin point cannot be specified, unlike what happens with other transportation modes such as the subway, which depends on the location of its stations. This aspect makes the walking trip times show greater variation than the other modes.

According Rocha *et al.* (2012), although there is still no consensus on the matter, 30 minutes is generally considered to be the maximum time for utilitarian trips. In our data, people also indicated maximum trip times of 30 minutes. However, according to the calculations based on these data, around 7.7% of pedestrians had trips of around 40 minutes, showing they underestimated the real travel time by 10 minutes, as most people did. Characteristics of the environment probably changed users' perception of time.

Around one-third of car and taxi users also indicated walking times ranging between 11 and 30 minutes, which means that although these are more expensive transport modes that allow passengers a door-to-door trip, due to circulation and parking restrictions in the surrounding areas users had to walk relatively long distances. This group of people, as well as the pedestrians with longer walking journeys, are more sensitive to changing transport mode if the prevailing accessibility conditions change. In contrast, users of high-capacity transport (trains and mainly subway) indicate a shorter walking time due to the proximity of the stations to the stadium. However, journeys shorter than 5 minutes are very unlikely considering the conditions of accessibility to the stadium on such a day.

5.3. Perception of quality of walking trips

In the complementary questionnaire, people were asked to evaluate the quality of the walking trips from their origin or the disembarking location, according to each main mode used. The evaluation consisted of assigning a score from 1 to 5, representing respectively: very bad, bad, regular, good, excellent. Generally, all individuals who took motorized trips gave a good evaluation score for the walking trip; 91.69% stated that the quality was good or very good. In the case of pedestrians, the opinions were very diverse and scattered, being 28% bad or very bad and 52% good or very good, with the average score being 3.32. Considering the evaluation of all users, the average score was 4.53.

However, an inverse relation can be noticed between the walking trip times indicated by interviewed people and the quality evaluation. The longer the times, the worse the evaluation is, as can be observed in Table 4. For journeys shorter than 5 minutes the average is 4.76, while for the ones longer than 20 minutes, it is 3.94.

The time of walking trips, logically, is related to the distance of the trip. Therefore, the closer to the stadium, the better the perception of quality is. Taking into account that renovations have been carried out in the areas surrounding Maracanã, improving the infrastructure and urban equipment, the answers might be connected to these conditions. Furthermore, during the Confederations Cup, the use and access of vehicles within the neighbouring areas of the stadium were restricted, favouring a safer environment for pedestrians. People who made longer journeys went through more varied urban environments with different walkability conditions.

Table 4. Quality evaluation of walking trips according to trip time in % and evaluation average

Trip Time (%)		Quality evaluation of walking trips (%)				Average
< 5 min	0.00	0.30	1.18	7.10	33.73	4.76
5 - 10 min	0.00	0.30	3.25	8.28	23.08	4.55
11 – 20 min	1.48	1.18	1.78	3.25	10.35	4.10
21 – 30 min	0.30	0	1.48	0.89	2.07	3.94
Total	1.78	1.78	7.69	19.52	69.23	4.53

6. Conclusions

The pedestrian quality of service is expressed through attributes that are affected by variables of the built environment. According to the literature, the evaluation of the attributes is related, among other trip characteristics, to the purpose of the trip, but for utilitarian trips, accessibility and rapidity are highly valued whereas comfort and sociability stand out for recreational and leisure trips. In this study, focusing on a major sporting event, we found that accessibility – proximity and ease – and rapidity are the attributes most valued by pedestrians, just as happens with utilitarian trips. The difference in these trips is that the attributes that encourage socialization and festive environment also stand out. The results show specificities for walking trips generated by major events and this suggests that the quality of the walk for this purpose should be given special treatment.

The sufficient supply and good conditions of infrastructure for pedestrians, as well as high density, mixed land use and an interconnected road network, are urban characteristics of the area near Maracanã which favour walking trips. All this together with the presence of middle and high-income population – with enough purchasing power to pay for match tickets – allows for a significant percentage of trips to be made on foot.

The results also show that the longer the walking times, the worse the perception of trip quality is. Nevertheless, considering that 50% of the pedestrians own a car, that 80% of these pedestrians stated that they did not use the car in this case due to parking difficulties and also that these spectators have an income level high enough to use transport modes such as taxi, it can be concluded that it is necessary to maintain and improve conditions that promote walking and restrict the use of cars to maintain or increase the proportion of walking trips.

Major events held in Rio de Janeiro in 2013, as well as the FIFA World Cup 2014, should leave a legacy to the city of improved quality of the infrastructure for pedestrians and in other aspects of the built environment that would promote walkability. Until the present date, despite the renovations in the areas surrounding the stadium, no significant improvement or local government policy can be seen that leads to concrete actions to address this matter. Therefore, investments should be made to stimulate the choice of walking as a mode of transportation, both for major events and for day-to-day trips.

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